Neuroscience MTA Rotation Projects: FALL 2023

Abha Rajbhandari, PhD - https://labs.icahn.mssm.edu/karkilab/

- Project: Brain (brainstem and forebrain structures) and Body (vagus, heart, and lungs) mechanisms in regulation of fear, stress, metabolic and cardiorespiratory functions relevant for developing novel therapeutic avenues for stress-related disorders such as post-traumatic disorder and panic disorder.

Alex Charney, MD, PhD - https://labs.icahn.mssm.edu/charneylab/

- Project: Multiscale investigations of the living human brain that bring together omics, neurophysiology, neuroimaging, and clinical data from the same patients to gain a deeper understanding of how the brain works.

Alison Goate, D.Phil - http://labs.neuroscience.mssm.edu/project/goate-lab/

- Project (computational): Analysis of transcriptomic and epigenomic data in models of Alzheimer's disease risk
- Project (wet-lab): Characterization of iPSC-derived microglial function in the setting of Alzheimer's disease risk/protection.

Andrew Chess, MD: http://labs.neuroscience.mssm.edu/project/chess-lab/

Anne Schaefer, MD, PhD - http://labs.neuroscience.mssm.edu/project/schaefer-lab/
The lab is interested in the role of neuron-microglia interaction in control of complex behaviors with a focus on neurodegenerative and psychiatric diseases.

- Projects for rotation: Microglia as key regulators of neuronal activity and complex behaviors Identification of neuroprotective microglia Epigenetic mechanisms of neuronal longevity

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Cameron McAlpine https://icahn.mssm.edu/profiles/cameron-s-mcalpine

Charles Mobbs, PhD - http://labs.neuroscience.mssm.edu/project/mobbs-lab/
The Mobbs lab has discovered a class of compounds that show great promise in treating Alzheimer's disease, stroke, and probably other neurodegenerative diseases, and projects are available to examine mechanisms mediating these effects, as well as develop better compounds with even more protective effects.

Daniela Schiller, PhD - http://labs.neuroscience.mssm.edu/project/schiller-lab/

The Schiller Lab for Affective Neuroscience - the rotation project will involve examining the neural mechanisms of emotion and social processes in human participants.

Deanna L Benson, PhD: http://labs.neuroscience.mssm.edu/project/benson-lab/
George Huntley, PhD: http://labs.neuroscience.mssm.edu/project/huntley-lab/

- Project 1: examine cholinergic, noradrenergic and dopaminergic signaling and anatomy in mPFC of young adult mice carrying a knockin mutation of a Parkinson's disease risk gene.
- Project 2: to examine composition, development and targeted manipulation of synapse structure

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Denise Cai, PhD: http://labs.neuroscience.mssm.edu/project/cai-lab/

Dolores Hambardzumyan, PhD - https://labs.icahn.mssm.edu/hambardzumyanlab/

- Project: To interrogate the mechanism of myeloid cell-derived immunotherapy resistance in brain tumors

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Dongming Cai, MD, PhD – https://labs.icahn.mssm.edu/cailab/

- Project: To develop preclinical candidates and new chemical scaffolds for Alzheimer's Disease therapies.

Eric J Nestler, MD, PhD: http://labs.neuroscience.mssm.edu/project/nestler-lab/

Erin A Hazlett, PhD: https://labs.icahn.mssm.edu/erin-hazlett-lab/

Gay Holstein, PhD - https://labs.icahn.mssm.edu/holstein-lab/

Fanny Elahi: https://icahn.mssm.edu/profiles/fanny-m-elahi

- Project 1: To investigate the role of the vestibular system in the control of blood pressure and heart rate.
- Project 2: To investigate the biophysical and morphological bases for variations in the modes of synaptic transmission between vestibular sensory hair cell receptors and their afferent and efferent endings

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Graham Ellis-Davies, PhD: http://labs.neuroscience.mssm.edu/project/ellis-davies-lab/

Hala Harony-Nicolas, PhD: https://labs.icahn.mssm.edu/harony-nicolaslab/

Hirofumi Morishita, MD, PhD: https://www.morishita-lab.com/

- Project: Molecular, circuit, and/or computational mechanism of juvenile critical period of prefrontal cortex maturation in control of social behavior using mouse models relevant to neurodevelopmental and psychiatric disorders.

Ian Maze, PhD - http://labs.neuroscience.mssm.edu/project/maze-lab/

- Project 1: Investigate the impact of histone H3 serotonylation on activity-dependent DNA methylation and gene expression in neurons
- Project 2: Explore neural cell-type specific regulatory mechanisms underlying major depressive disorder and/or substance use disorder
- Project 3: Examine the impact of protein monoaminylation on synaptic to nuclear signaling events in brain

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Ignacio Saez, PhD -

Studying the neural basis of human decision-making behavior and mood using invasive electrophysiological recordings in human patients.

James Iatridis, PhD - https://labs.icahn.mssm.edu/iatridislab/

- Projects for rotation: Identify TNFα-modulated cells and molecular pathways critical in the cross-talk between intervertebral disc injury and dorsal root ganglia neuropathy in long-term discogenic back pain. Wet lab and computational studies also develop novel

treatment strategies for chronic back pain including identifying potential sex differences in pathology and treatments.

Jennifer Foss-Feig, PhD: https://labs.icahn.mssm.edu/foss-feig-lab/

- Project: Neural mechanisms of alterations in sensory and social processing in individuals with autism spectrum disorder

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Joe Castellano, PhD - http://labs.neuroscience.mssm.edu/project/castellano-lab/
Our lab is primarily focused on characterizing communication between the periphery and the brain in the context of aging and neurodegeneration. **(1)** A key direction in the lab deals with understanding the role of major genetic risk factors for Alzheimer's disease and the extent to which peripheral immune function modulates the activity and function of microglia within susceptible brain regions. **(2)** Another large aim of our lab is to characterize specific proteins in the blood that act on CNS circuits to modulate aging and neurodegenerative phenotypes, including Alzheimer's disease pathologies. We use a variety of tools from cell culture to in vivo behavioral studies, and we are increasingly relying on computational tools to gain deeper insight into these questions. Please contact joseph.castellano@mssm.edu for more details for a rotation.

Ki Goosens, PhD - https://labs.icahn.mssm.edu/goosenslab/
We have multiple projects designed to investigate how neural circuits are altered by chronic stress and how acyl-ghrelin and other hormones contribute to stress and disease.

Laurel Morris, PhD: https://labs.icahn.mssm.edu/morrislab/

Magdalena Janecka, PhD - https://labs.icahn.mssm.edu/janeckalab/

- Project: Genetic and epidemiologic overlap between psychiatric disorders and reproductive function.

Marek Mlodzik, PhD: https://labs.icahn.mssm.edu/mlodziklab/

Miguel Gama-Sosa, PhD: https://www.mountsinai.org/profiles/miguel-a-gama-sosa

Greg Elder, MD: https://icahn.mssm.edu/profiles/gregory-a-elder

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Nan Yang, PhD: http://labs.neuroscience.mssm.edu/project/yang-lab/

- Project 1. Functional mapping of psychiatric disorder-associated noncoding regulatory variants in human neuronal subtypes. This project employs several genomic

technologies including the promoter-capture HiC, CRISPR-based screen and the Massively Parallel Reporter Assay (MPRA) to better understand disease-associated noncoding regulatory elements in neuronal subtypes, including where they reside, how they work, and what genes they regulate.

- Project 2. Exploring the impact of autism risk genes in neurodevelopment and neuronal function. Here, we use human cellular model systems to fully elucidate the molecular and cellular function of highly-penetrant genes – particularly those encoding chromatin remodelers for autism.

Nik Robakis, PhD - http://labs.neuroscience.mssm.edu/robakis-lab/

The laboratory for Molecular Biology and Genetics of Neurodegeneration, currently concentrates on cell reprograming and its applications in neurodegenerative disorders. Specifically we directly reprogram fibroblasts isolated from Alzheimer's disease (AD) and control patients to neurons. The goal is to detect neuron-associated molecular differences between neurons derived from AD and control donors. Reprogrammed neurons are also subjected to toxic insults to test for toxicity-associated differences. A second project isolates exosomes from reprogrammed neurons and asks for molecular differences between AD and control exosomes. Transgenic mouse models are also used to study mechanisms involved in increased vulnerability to excitotoxicity and Ischemia of neurons expressing familial AD mutants compared to controls.

Panagiotis Roussos, MD, MS, PhD: https://labs.icahn.mssm.edu/roussos-lab/

Patrick R Hof, MD: http://labs.neuroscience.mssm.edu/project/hof-lab/

Paul Kenny, PhD: http://labs.neuroscience.mssm.edu/project/kenny-lab/

- Project: Investigate the molecular, cellular, and circuit-level mechanisms of drug addiction.

Paul Slesinger, PhD: http://labs.neuroscience.mssm.edu/project/slesinger-lab/

Rita Z. Goldstein, PhD: http://icahn.mssm.edu/research/narc/about
The multidisciplinary and multimodal neuroimaging study of the cognitive and emotional processes underlying human drug addiction.

Roger Clem, PhD - http://labs.neuroscience.mssm.edu/project/clem-lab/
Rotation projects available to study prefrontal cortex cell populations that mediate encoding of positive and negative experiences.

Schahram Akbarian, MD, PhD - http://labs.neuroscience.mssm.edu/akbarian-lab/
The lab explores genome organization and function across the lifespan of human and mouse brain, including changes in psychiatric and substance abuse disorders.

Projects available:

- Longitudinal epigenomic profiling in selected neuronal populations of postnatal and adolescent mouse brain
- Exogenous and endogenous retroviruses and retrotransposons shaping genome organization in specific cell types of human and mouse brain

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Scott J Russo, PhD: http://labs.neuroscience.mssm.edu/project/russo-lab/

Sergei Y Sokol, PhD: https://labs.icahn.mssm.edu/sokollab/

- Project 1. Use live imaging to compare roles of various cell behaviors in modeling neural plate closure.
- Project 2. Study how planar cell polarity proteins influence neural progenitor shape and cell fate.

Stephanie Tankou, MD, PhD - https://labs.icahn.mssm.edu/tankoulab/

- Project: to elucidate the mechanism by which gut proteases regulate neuroinflammation in a mouse model of Multiple Sclerosis.

The Seaver Autism Center (multiple Investigators) - https://icahn.mssm.edu/research/seaver/research
The Seaver Center, directed by Joseph Buxbaum, has four research arms: 1) a gene discovery group that uses large whole exome and whole genome samples to identify genes for pediatric-onset psychiatric disorders; 2) a functional group that uses stem cells and animal models to understand the role of major effect genes in autism; 3) a epidemiology group that makes use of national registries to understand risk architecture of pediatric-onset psychiatric disorders and collects DNA within this framework; and, 4) a clinical research group that studies both idiopathic autism and autism associated with several genes of

major effects. For some autism genes, we have studies at all levels (discovery, functional dissection in vitro and in vivo, and patient-based studies), and all of our studies generate and/or make use of big data, so there are also opportunities for computational studies. See: http://www.seaverautismcenter.org

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Timothy Blenkinsop, PhD - https://labs.icahn.mssm.edu/blenkinsoplab/

- Project: Studying the role of inflammation on retina regeneration

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Towfique Raj, PhD - https://rajlab.org/

- Project: Investigate the cellular phase of Alzheimer's disease using single-cell and spatial transcriptomics. This project is part of larger initiative in the lab to use single cell RNAseq (scRNASeq) and proteomics (CITE-seq and cyTOF) to untangle the cellular response to inflammatory stimuli in Alzheimer's disease. Mostly computational but some wet lab opportunities to generate single cell data from primary microglia of autopsied brain tissues on 10x Chromium.

Xiaosi Gu, PhD - https://labs.icahn.mssm.edu/gulab/

- Project: Computational modeling of value-based decision making in social and non-social contexts.

Dr. Xiaoting Wu Research is focused on understanding the neurobiology of social cognition. We live in a social environment and the ability to distinguish various individuals, form memories of social encounters and make appropriate decisions is pivotal to our lives. How do neural circuitries and synaptic plasticity mediate social cognitive processes? The Wu lab will use multi-disciplinary approaches across molecular, synaptic, and behavioral scales to investigate this question and employ cutting-edge techniques such as optogenetics, fiber photometry, electrophysiology, and single cell transcriptomics to uncover the mechanisms underlying social cognition. For more information about the lab please visit: https://labs.neuroscience.mssm.edu/project/wu-lab/

Zhenyu Yu, PhD - https://labs.icahn.mssm.edu/yuelab/

The Yue lab employs an array of experimental and bioinformatic tools, such as mouse genetics, molecular and cellular biology, transcriptomics (snRNAseq), proteomics, imaging (live and fixed), animal pathology/behavior, human iPSC neurons/glia and human postmortem tissue analysis to dissect synaptic vesicle trafficking, cell metabolism, neuroinflammation, autophagy-lysosomes, and protein/lipid kinase signaling in the neuropathogenesis in Parkinson's, Alzheimer's and Huntington's diseases. We are also performing translational research in therapeutic development. Multiple projects are available.

Herbert Wu https://www.wulab.bio/

Jinye Dai, PhD

Dr. Dai's research interest is directed at better understanding of basic molecular mechanisms of synaptic function and neuropsychiatric disorders (***Neuron***, 2019; ***Cell***, 2019; ***Mol. Psychiatry***, 2021; ***Nature***, 2021; ***eLife***, 2022). The future research interests of the Dai lab will focus on the interplay between genetic and environmental stressors in the adaptive healthy brain function and pathology of social stress-induced decompensation in neuropsychiatric disorders (https://labs.icahn.mssm.edu/jinyedailab/).